KRAMER ELECTRONICS LTD.

USER MANUAL

MODEL:

VS-4228
8-Port RS-422 Matrix Switcher

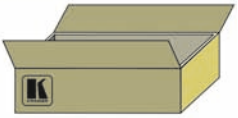
P/N: 2900-002033 Rev 4

VS-4228 Quick Start Guide

This page guides you through a basic installation and first-time use of your **VS-4228**.
For more detailed information, see the **VS-4228** User Manual.
You can download the latest manual at http://www.kramerelectronics.com.

Step 1: Check what's in the box

- **VS-4228** 8-Port RS-422 Matrix Switcher
- 1 Power cord
- 4 Rubber feet
- 1 Quick Start sheet
- 1 User Manual
- Windows®-based Kramer control software



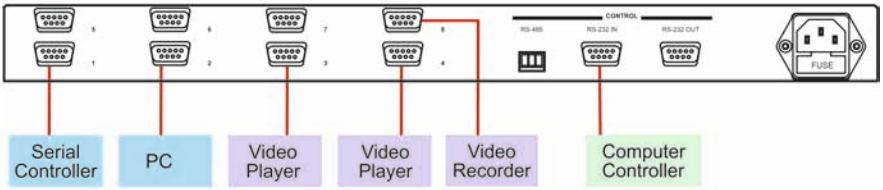
Save the original box and packaging in case your **VS-4228** needs to be returned to the factory for service.

Step 2: Install the VS-4228

Mount the machine in a rack or attach the rubber feet and place on a table.

Step 3: Connect the masters and slaves

Always switch off the power on each device before connecting it to your **VS-4228**.



Always use Kramer high-performance cables for connecting AV equipment to the **VS-4228.**

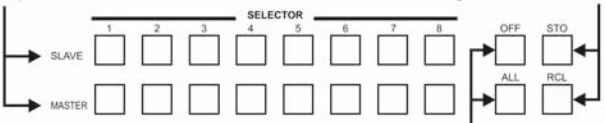
Step 4: Connect the power

Connect the power cord to the **VS-4228** and plug it into the mains electricity.

Step 5: Operate the VS-4228

Associate master to slave devices from the front panel buttons.

Store and recall setup configurations using the STO and RCL buttons.



Connect one master to all slave devices with the ALL button or disconnect devices with the OFF button.

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer **VS-4228** *8-Port RS-422 Matrix Switcher*, which is ideal for the following typical applications:

- Remote control of video and audio production studios
- Live broadcast remote control
- CCTV and other remote control applications

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual

  Use Kramer high performance high resolution cables
  Use only the power cord that is supplied with this machine

Go to http://www.kramerelectronics.com to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Do not secure the cables in tight bundles or roll the slack into tight coils
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **VS-4228** away from moisture, excessive sunlight and dust

3 Overview

The **VS-4228** is a high-performance bidirectional matrix switcher for RS-422 control signals. It can connect multiple ports to create from one to four bidirectional communication groups.

In particular, the **VS-4228** features:

- Simple-to-connect automatic master/slave configuration
- A bright LED display showing the status of the matrix switcher
- Recall of up to 8 configuration setups via the non-volatile memory
- Control via the front panel buttons, or remotely by RS-485 or RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller

3.1 Defining the VS-4228 8-Port RS-422 Matrix Switcher

This section defines the **VS-4228**.

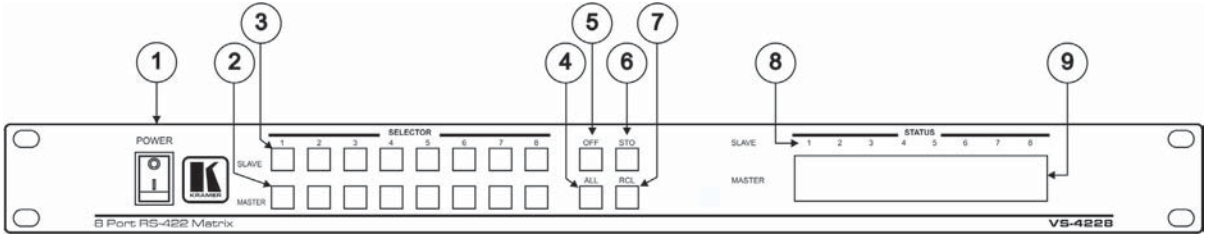


Figure 1: VS-4228 8-Port RS-422 Matrix Switcher Front Panel

#	Feature	Function
1	*Power* Switch	Illuminated switch that turns power ON and OFF
2	*MASTER* Buttons	Select the MASTER to switch to the SLAVE
3	*SLAVE* Buttons	Select the SLAVE to which the MASTER is switched
4	*ALL* Button	Pressing *ALL* before pressing a *MASTER* button, connects all SLAVE devices to that MASTER
5	*OFF* Button	Pressing *OFF* after pressing a *SLAVE* button disconnects the MASTER. To disconnect all the SLAVE devices, press the *ALL* button and then the *OFF* button
6	*STO* Button	Pressing *STO* (STORE) followed by an *SLAVE* button stores the current setting
7	*RCL* Button	Pressing the *RCL* (RECALL) button and the corresponding *SLAVE* key recalls a setup. The stored status flashes. Pressing a different *SLAVE* button lets you view another setup. After making your choice, pressing the *RCL* button again implements the new status
8	*SLAVE STATUS*	Labels identify a cross point between each SLAVE to which the MASTER displayed below is connected
9	*MASTER STATUS*	The number shows the selected MASTER switched to the SLAVE (below the corresponding SLAVE label)

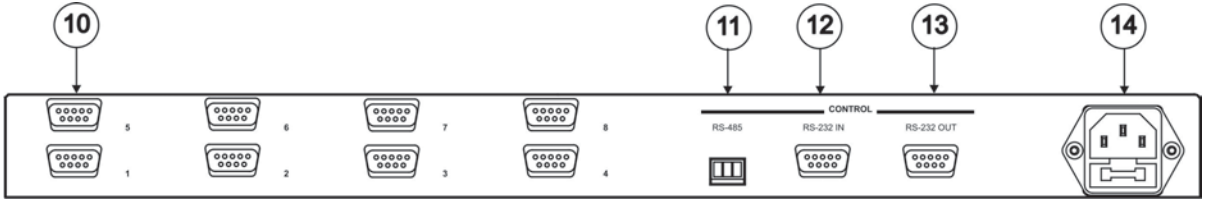


Figure 2: VS-4228 8-Port RS-422 Matrix Switcher Rear Panel

#	Feature	Function
10	RS-422 9-pin D-sub Connectors	RS-422 bi-directional ports (1-8)
11	*CONTROL RS-485* Terminal Block Connector	Connector for external RS-485 control (PINOUT: G, -, +)
12	*CONTROL RS-232 IN* 9-pin D-sub Connector	Connect to the PC serial port
13	*CONTROL RS-232 OUT* 9-pin D-sub Connector	Connect to the RS-232 IN port of the next unit
14	Power Connector with Fuse	AC connector enabling power supply to the unit

3.2 About RS-422

RS-422 control switchers differ substantially from video and audio switchers in both design and in operation, as Sections 3.2.1 to 3.2.6 describe.

3.2.1 Signal Terminology

Connections are between master and slave or controller and controlled devices, rather than the regular In and Out or source and destination devices. The difference is not merely one of semantics but a vital distinction when trying to understand the concept of RS-422 technology.

A regular In and Out switcher has separate input and output buttons on the front panel and separate ports for input and output connectors on the rear panel.

A master and slave control switcher, has separate master and slave buttons on the front panel but shared master/slave connectors on the rear panel.

3.2.2 Bi-directional Signals

By using a pair of conductors, each signal travels in both directions over a balanced line between master/slave devices, as Figure 3 illustrates:

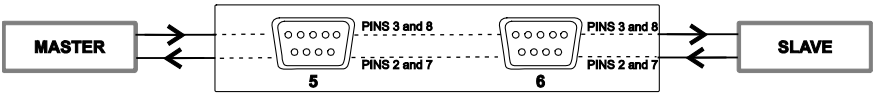


Figure 3: Bi-directional Signals I

When a master device changes position with a slave device, the pins automatically change, as Section 3.2.4 describes and as Figure 4 illustrates:

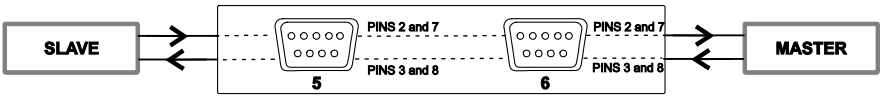


Figure 4: Bi-directional Signals II

A master device always transmits over pins 3 and 8 and receives over 2 and 7.
A slave device always transmits over pins 2 and 7 and receives over 3 and 8.

The communication path must be kept clear between the master and slave units in both directions, since the slave device must respond to any command transmitted by the master. If the master receives no response from the slave, the master cancels the communication with the slave machine and sometimes flags a message: *no communication*.

For example, in video production when a special controller (with play and rewind functionality) is the master device, each command transmitted to the slave device must reach that slave device and that slave device must respond, otherwise the master device disconnects.

3.2.3 Device Definition

In many broadcast applications, different machines involved in production can be either slaves or masters. Using a device as a master means that the device *talks* via pins 3 and 8 and *listens* via pins 2 and 7. In another setup, that uses the same device as a slave, this means that the device *talks* via pins 2 and 7 and *listens* via pins 3 and 8.

For example, an edit controller always works as a master. During an editing session, a VTR may be the slave to the edit controller. However, in a duplication setup, the VTR may become a master for a second VTR.

3.2.4 Automatic Configuration

After connecting the 9-pin D-sub connectors and cables between the controlled units, the **VS-4228** automatically configures which pins to use in the 9-pin D-sub connector according to the assignment of each machine.

3.2.5 Port Definitions

Modern equipment usually has only one connector, RS-422, which functions as a master as well as a slave.

Some older broadcast equipment contains 3 RS-422 connectors; RS-422-In, RS-422-Out and RS-422-In/Out. You can only connect a master to a RS-422-In port and you can only connect a RS-422-Out port to a slave. When connecting to a RS-422-In/Out port the unit changes dynamically, automatically reconfiguring the 9-pin D-sub port pins to be either a master or a slave.

3.2.6 More Than One Slave

Communication between one master and one slave is simple. However, communication between one master and several slaves, for example, in duplication applications, is more complicated.

If all the slaves were to respond simultaneously to a master command, the system would lock up. To avoid such a situation, a special algorithm in the **VS-4228** dictates that the master receives only the response from the highest priority slave (the lowest numbered slave device) with more than one slave device. For example, in a setup in which port # 7 is the master, and ports # 5, # 3 and # 6 are slaves, the **VS-4228** only transmits to the master the reply from port # 3 and discards all the other replies.

Pay special attention: in broadcast applications, the most common reply message from a slave is the TIMECODE data, therefore, with the above-described algorithm; the response comes from the lowest numbered slave.

4 Connecting the VS-4228

Always switch off the power to each device before connecting it to your **VS-4228**. After connecting your **VS-4228**, connect its power and then switch on the power to each device.

To connect the VS-4228 as illustrated in Figure 5:

1. Connect ports 1 through 8 to all master and slave devices using 9-pin D-sub (M) connector cables.
   Not all ports have to be connected.
   The power cord is not shown in Figure 5.

2. If RS-232 control is required, connect a PC via the null-modem adapter (when using the Kramer Control software or other controller) as described in Section 4.1.

3. If RS-485 control is required, connect a cable to the RS-485 terminal block, as described in Section 4.2.

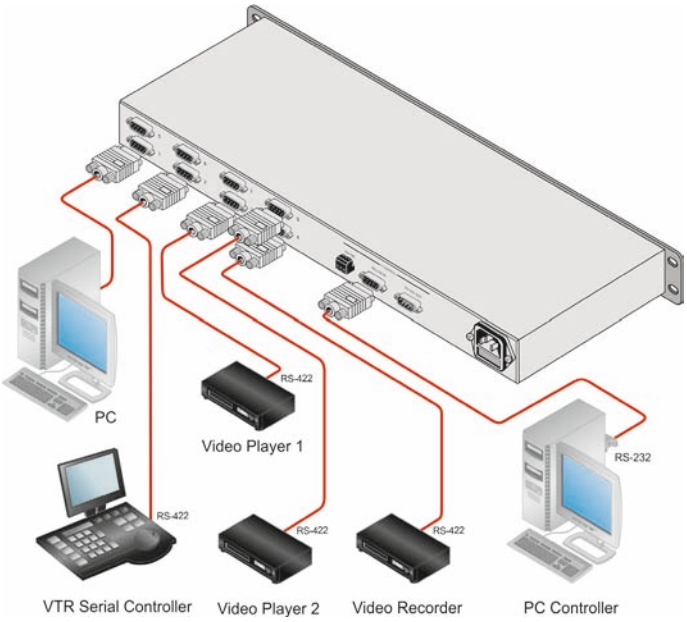


Figure 5: Connecting the VS-4228 8-Port RS-422 Matrix Switcher

4.1 Connecting a PC or Controller to the RS-232 Port

You can connect to the unit via a crossed RS-232 connection, using for example, a PC. A crossed cable or null-modem is required as shown in method A and B respectively. If a shielded cable is used, connect the shield to pin 5.

Method A (Figure 6)—Connect the RS-232 9-pin D-sub port on the unit via a crossed cable (only pin 2 to pin 3, pin 3 to pin 2, and pin 5 to pin 5 need be connected) to the RS-232 9-pin D-sub port on the PC.
Note: There is no need to connect any other pins.

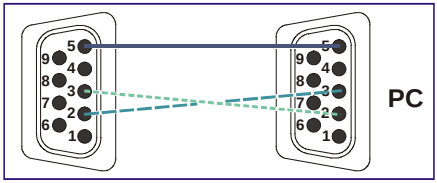


Figure 6: Crossed Cable RS-232 Connection

Hardware flow control is not required for this unit. In the rare case where a controller requires hardware flow control, short pin 1 to 7 and 8, and pin 4 to 6 on the controller side.

Method B (Figure 7)—Connect the RS-232 9-pin D-sub port on the unit via a straight (flat) cable to the null-modem adapter, and connect the null-modem adapter to the RS-232 9-pin D-sub port on the PC. The straight cable usually contains all nine wires for a full connection of the D-sub connector. Because the null-modem adapter (which already includes the flow control jumpering described in Method A above) only requires pins 2, 3 and 5 to be connected, you are free to decide whether to connect only these 3 pins or all 9 pins.

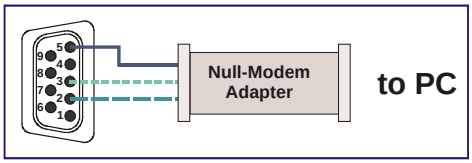


Figure 7: Straight Cable RS-232 Connection with a Null Modem Adapter

4.2 Connecting a PC or Controller to the RS-485 Port

You can operate the **VS-4228** via the RS-485 port from a distance of up to 1200m (3900ft) using any device equipped with an RS-485 port (for example, a PC). For successful communication, you must set the RS-485 machine number and bus termination.

To connect a device with a RS-485 port to the **VS-4228**:

- Connect the A (+) pin on the RS-485 port of the PC to the A (+) pin on the RS-485 port on the rear panel of the **VS-4228**
- Connect the B (–) pin on the RS-485 port of the PC to the B (–) pin on the RS-485 port on the rear panel of the **VS-4228**
- Connect the G pin on the RS-485 port of the PC to the G pin on the RS-485 port on the rear panel of the **VS-4228**

4.3 Cascading Multiple Units

You can cascade up to eight individual **VS-4228** units to switch up to 64 master/slave devices using either the RS-232 (see Section 4.3.1) or RS-485 (see Section 4.3.2) interfaces.

When cascading two or more devices, you must set a unique machine number for each device.

To set the machine number:

1. Turn the **VS-4228** ON. The flashing digit in the display is the machine number of the device.
2. To set another number, press the SLAVE button of the desired number while the digit is flashing. The digit changes to the new number. When it stops flashing, the new machine number is set.

4.3.1 Cascading Via the RS-232 Control Interface

Connect the PC to units as described in Section 4.1 and shown in Figure 8.

Use a straight cable and connect pins 2 to 2, 3 to 3 and 5 to 5.

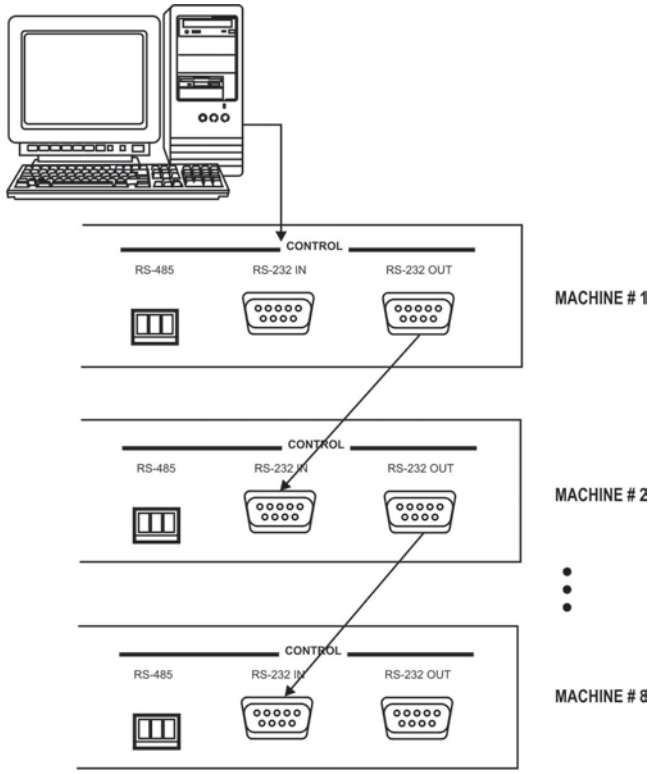


Figure 8: Cascading Units via the RS-232 Control Interface

4.3.2 Cascading Via the RS-485 Control Interface

To connect an RS-485 connector on one **VS-4228** unit to an RS-485 connector on another unit:

1. Connect the “+” PIN on the first **VS-4228** unit to the “+” PIN on the second **VS-4228** unit
2. Connect the “-” PIN on the first **VS-4228** unit to the “-” PIN on the second **VS-4228** unit

3. If shielded cable is used for an RS-485 connection, connect the shield to the Ground PIN.

Figure 9 illustrates the RS-485 line that connects:

- Between each **VS-4228** unit
- To the PC via a Kramer Tools **VP-43xl** *Interface Converter* (connect the PC's 9-pin D-sub COM port to the "RS-232 in" 9-pin D-sub (F) port on the **VP-43xl**. Next, connect the RS-485 port on the **VP-43xl** to the RS-485 ports on the **VS-4228** units)

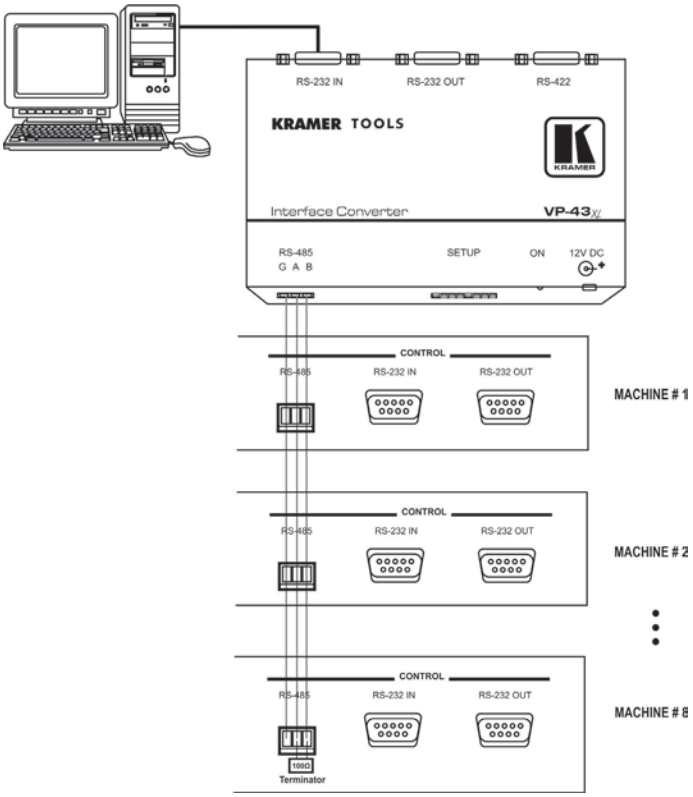


Figure 9: Cascading Units via the RS-485 Control Interface

Note: When cascading multiple units using the RS-485 interface, you must connect a 100Ω terminator between the + and – pins of the last **VS-4228** on the line.

5 Operating the VS-4228

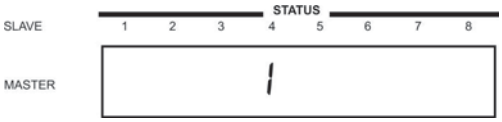
Referring to the connection diagram in Figure 5, you see the following setup:

Master devices: Port 1 – PC
Port 2 – VTR Serial Controller

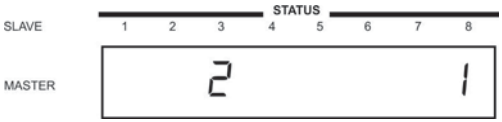
Slave devices: Port 3 – Video Player 1
Port 4 – Video Player 2
Port 8 – Video Recorder

The following examples show how to operate the **VS-4228**:

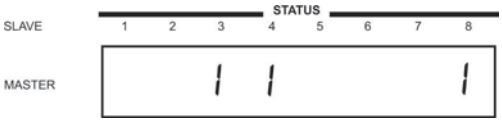
1. To connect the PC to Video Player 2:
   - Press SLAVE 4, then MASTER 1.
     The following status displays:



2. To connect the VTR Serial Controller to Video Player 1 and PC to the Video Recorder:
   - Press SLAVE 3, MASTER 2, SLAVE 8 and MASTER 1.
     The following status displays:

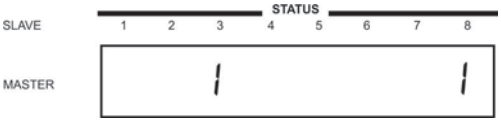


3. To connect the PC to all slaves:
   - Press ALL, then MASTER 1.
     The following status displays:



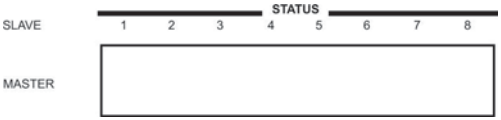
4. To disconnect the PC from the Video Player 2 in the previous status:

   - Press SLAVE 4 and OFF.
     The following status displays:



5. To disconnect all masters:

   - Press ALL, then OFF.
     The following status displays:



6 Technical Specifications

INPUT/OUTPUT:	8 in/out ports on 9−pin D−sub (F) connectors
CONTROL:	Front panel buttons, RS−485 and RS−232 serial interface (in and out)
INDICATORS:	8−character display on the front panel
STANDARDS COMPLIANCE:	TIA/EIA-422-B and SMPTE 207M
OPERATING TEMPERATURE:	0° to +55°C (32° to 131°F)
STORAGE TEMPERATURE:	-45° to +72°C (-49° to 162°F)
HUMIDITY:	10% to 90%, RHL non-condensing
DIMENSIONS:	19” x 7” x 1U (W, D, H) rack-mountable
POWER SOURCE:	230V AC, 50/60 Hz, (115V AC, U.S.A.) 10VA
WEIGHT:	2.2 kg (4.88 lbs) approx
ACCESSORIES:	Power cord, Windows® Control Software
Specifications are subject to change without notice at http://www.kramerelectronics.com	

7 Default Communication Parameters

RS-232 Protocol 2000	
Baud Rate:	9600
Data Bits:	8
Stop Bits:	1
Parity:	None
Command Format:	HEX
Example (Output 1 to Input 1):	0x01, 0x81, 0x81, 0x81
Ethernet	
IP Address:	192.168.1.39
TCP Port Number:	5000
Network Mask:	255.255.255.0
Default Gateway:	192.168.1.1

8 Hex Codes

The following table includes Protocol 2000 hexadecimal codes (the protocol uses 4 bytes of information, data is at 9600 baud, no parity, 8 data bits and one stop bit). Full details are available at our web site: www.kramerelectronics.com.

	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8
M 1		01 81 82 81	01 81 83 81	01 81 84 81	01 81 85 81	01 81 86 81	01 81 87 81	01 81 88 81
M 2	01 82 81 81		01 82 83 81	01 82 84 81	01 82 85 81	01 82 86 81	01 82 87 81	01 82 88 81
M 3	01 83 81 81	01 83 82 81		01 83 84 81	01 83 85 81	01 83 86 81	01 83 87 81	01 83 88 81
M 4	01 84 81 81	01 84 82 81	01 84 83 81		01 84 85 81	01 84 86 81	01 84 87 81	01 84 88 81
M 5	01 85 81 81	01 85 82 81	01 85 83 81	01 85 84 81		01 85 86 81	01 85 87 81	01 85 88 81
M 6	01 86 81 81	01 86 82 81	01 86 83 81	01 86 84 81	01 86 85 81		01 86 87 81	01 86 88 81
M 7	01 87 81 81	01 87 82 81	01 87 83 81	01 87 84 81	01 87 85 81	01 87 86 81		01 87 88 81
M 8	01 88 81 81	01 88 82 81	01 88 83 81	01 88 84 81	01 88 85 81	01 88 86 81	01 88 87 81	

LIMITED WARRANTY

The warranty obligations of Kramer Electronics for this product are limited to the terms set forth below:

What is Covered

This limited warranty covers defects in materials and workmanship in this product.

What is Not Covered

This limited warranty does not cover any damage, deterioration or malfunction resulting from any alteration, modification, improper or unreasonable use or maintenance, misuse, abuse, accident, neglect, exposure to excess moisture, fire, improper packing and shipping (such claims must be presented to the carrier), lightning, power surges, or other acts of nature. This limited warranty does not cover any damage, deterioration or malfunction resulting from the installation or removal of this product from any installation, any unauthorized tampering with this product, any repairs attempted by anyone unauthorized by Kramer Electronics to make such repairs, or any other cause which does not relate directly to a defect in materials and/or workmanship of this product. This limited warranty does not cover cartons, equipment enclosures, cables or accessories used in conjunction with this product.

Without limiting any other exclusion herein, Kramer Electronics does not warrant that the product covered hereby, including, without limitation, the technology and/or integrated circuit(s) included in the product, will not become obsolete or that such items are or will remain compatible with any other product or technology with which the product may be used.

How Long Does this Coverage Last

Seven years as of this printing; please check our Web site for the most current and accurate warranty information.

Who is Covered

Only the original purchaser of this product is covered under this limited warranty. This limited warranty is not transferable to subsequent purchasers or owners of this product.

What Kramer Electronics will do

Kramer Electronics will, at its sole option, provide one of the following three remedies to whatever extent it shall deem necessary to satisfy a proper claim under this limited warranty:

1. Elect to repair or facilitate the repair of any defective parts within a reasonable period of time, free of any charge for the necessary parts and labor to complete the repair and restore this product to its proper operating condition. Kramer Electronics will also pay the shipping costs necessary to return this product once the repair is complete.
2. Replace this product with a direct replacement or with a similar product deemed by Kramer Electronics to perform substantially the same function as the original product.
3. Issue a refund of the original purchase price less depreciation to be determined based on the age of the product at the time remedy is sought under this limited warranty.

What Kramer Electronics will not do Under This Limited Warranty

If this product is returned to Kramer Electronics or the authorized dealer from which it was purchased or any other party authorized to repair Kramer Electronics products, this product must be insured during shipment, with the insurance and shipping charges prepaid by you. If this product is returned uninsured, you assume all risks of loss or damage during shipment. Kramer Electronics will not be responsible for any costs related to the removal or re-installation of this product from or into any installation. Kramer Electronics will not be responsible for any costs related to any setting up this product, any adjustment of user controls or any programming required for a specific installation of this product.

How to Obtain a Remedy under this Limited Warranty

To obtain a remedy under this limited warranty, you must contact either the authorized Kramer Electronics reseller from whom you purchased this product or the Kramer Electronics office nearest you. For a list of authorized Kramer Electronics resellers and/or Kramer Electronics authorized service providers, please visit our web site at www.kramerelectronics.com or contact the Kramer Electronics office nearest you.

In order to pursue any remedy under this limited warranty, you must possess an original, dated receipt as proof of purchase from an authorized Kramer Electronics reseller. If this product is returned under this limited warranty, a return authorization number, obtained from Kramer Electronics, will be required. You may also be directed to an authorized reseller or a person authorized by Kramer Electronics to repair the product.

If it is decided that this product should be returned directly to Kramer Electronics, this product should be properly packed, preferably in the original carton, for shipping. Cartons not bearing a return authorization number will be refused.

Limitation on Liability

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Other Conditions

This limited warranty gives you specific legal rights, and you may have other rights which vary from country to country or state to state.

This limited warranty is void if (i) the label bearing the serial number of this product has been removed or defaced, (ii) the product is not distributed by Kramer Electronics or (iii) this product is not purchased from an authorized Kramer Electronics reseller. If you are unsure whether a reseller is an authorized Kramer Electronics reseller, please visit our Web site at www.kramerelectronics.com or contact a Kramer Electronics office from the list at the end of this document.

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SAFETY WARNING
Disconnect the unit from the power supply before opening and servicing